United States
Environmental Protection Agency
Office of Transportation and Air Quality
National Vehicle and Fuel Emissions Laboratory
2565 Plymouth Road
Ann Arbor, MI 48105

Horiba Single Roll Dynamometer
Vehicle Installation and Removal Procedure

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure is for reference only and is not an endorsement of those products. This document may be used for guidance by other laboratories.

NVFEL Reference Number

723

Implementation Approval

Original Procedure Authorized by EPCN # 412 on 12-20-05

Revision Description

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Attachments

1. Purpose and Overview:

The following procedure describes the process for the installation, set-up and subsequent removal of a vehicle to be operated on a Horiba 48” single roll electric dynamometer.

2. Applicability:

This procedure is applicable to vehicles operated at speeds less than 85 mph (137 kph) on dynamometers Horiba D002, D003 and D005.

3. References:

3.1 NVFEL Procedure 701 “Vehicle Inspection and Acceptance”

3.2 "Horiba Dynamometer Operations Manual"

3.3 NVFEL 709 “Hot Soak Evaporative Emission Test Procedure”

3.4 NVFEL Form 700-03 “Preconditioning & Sample Collection” (Shown in Attachment “A”)

3.5 NVFEL Form 700-01 “Test Parameters / Data”

3.6 NVFEL Blueprint file drawings TO4 88B-(0-11)

3.7 NVFEL current safety policies and procedures

4. Required Equipment:

4.1 Exhaust Connectors fabricated to meet requirements of blueprint file drawings TO4 88B-(0-11).

- 4.1.1 Flexible exhaust tubes
- 4.1.2 Exhaust tube adapters
- 4.1.3 Clamps
- 4.1.4 Gaskets and boot assembly

4.2 A fixed-speed cooling fan with a capacity not exceeding 5,300 cubic feet per minute (cfm) for the FTP and HFET tests and 15,000 cfm for the USO6. Additional or special cooling fans may be used if approved in advance by Certification Division or the appropriate Task Officer.

- 4.2.1 Typical equipment used: Hartzell Fan Model #N24-DUWS

4.3 Compressed air supply with air hose, tire inflation chuck, and calibrated pressure gauge.

4.4 Wheel restraints and tie down straps

4.5 Impact wrench and sockets

5. Precautions:

5.1 Personnel in the test cell should avoid close proximity to the vehicle when the dynamometer roll cradle is raised or lowered. The vehicle may shift up to a foot when the cradle is raised or lowered.

5.2 Vehicle must be securely restrained prior to start of test.

5.3 Components connected to the exhaust system will become hot during test and could cause burns to skin.

5.4 The vehicle setup described in this procedure is not suitable for vehicles operated in excess of 85 mph (137 kph). Consult with the team leader regarding any non-standard vehicle set up before operating the vehicle on the dynamometer.

6. Visual Inspection:

6.1 Ensure the access area to the dynamometer is clear and free of equipment or extraneous material that will interfere with the installation of the vehicle on or removal from the dynamometer.

6.2 Ensure that the wheel restraints and straps are in good condition and free of significant wear.

6.3 Ensure that the test cell air handler is in the “TEST” mode.

7. Preparation:

7.1 Prior to installation, the test vehicle shall be prepared in accordance with procedure NVFEL 701 “Vehicle Inspection and Acceptance”

7.2 Ensure that the correct starting procedures are located in the vehicle. If they are not locate the documents before proceeding.

8. Procedure:

100 Vehicle Installation:

The following steps are performed after acceptance of the vehicle and initial set-up of the dynamometer. Unless otherwise indicated, the driver is responsible for ensuring that the following steps are performed and where applicable documented on Form 700-03 “Preconditioning & Sample Collection” (Shown in Attachment “A”).

101 Cradle and centering functions can be controlled by either the Remote micro-terminal at the driver’s station or the dynamometer computer in the site control room.

102 Retract the roll covers of the 48" single-roll electric dynamometer by pressing the "COVER ON/OFF" button on the Remote Driver’s Station.

103 Raise the roll cradle using the Remote Driver’s Station by pressing the "CRADLE UP/DOWN" button.

104 Ensure that the correct starting procedures are located in the vehicle. If they are not, locate the documents.

105 Check that all accessory switches on the test vehicle are in the "Off" position prior to starting the engine.

106 Slowly move or drive, as applicable, the test vehicle onto the dyno rolls in a straight direction and position the vehicle in the center of the dyno.

For all cold start tests including the FTP; do not start the engine, place the drive wheels of the vehicle on the dynamometer roll, and leave the vehicle in neutral.

For all hot start tests including the HFET; drive the vehicle onto the dynamometer, locating the drive wheels on the dynamometer roll, and leave the vehicle in neutral.

Note: NVFEL Form 701-01 “Test Parameters / Data” provided with the test packet specifies the drive axle.

107 Ensure that transmission is not engaged and the parking brake is off.

108 Center the vehicle by pressing the Remote Driver's Station "CENTERING START/STOP" button.

The "CENTERING START/STOP" button on the Remote Microterminal will remain lit, and the dynamometer computer screen will show acceleration to a speed of 2 mph while the rolls are turning.

109 Visually ensure that the front and rear cradle rolls are turning at about the same speed and that both vehicle drive wheels are positioned approximately at the roll surface crown.

110 Visually ensure that the vehicle is aligned perpendicular to the centerline of the rolls. Adjust the steering wheel as necessary to aid alignment.

111 Stop the rolls by pressing the Remote "CENTERING START/STOP" button, when vehicle is centered.

112 Position one of the wheel restraint assemblies around a non-drive wheel of the vehicle. Insert the linkage bar locking nuts in the tee-slot tracks.

113 Slide the moveable wheel restraint so that both parts of the chock assembly fit against the tire and draw the chocks firmly together against the tire by turning the handle clockwise on the threaded rod.

114 Using an impact wrench, secure the locking nuts which bolt the free end of the linkage bars to the tee-slot tracks and the center nut which connects the two arms.

115 Repeat Steps 112 through 114 to secure the other non-drive wheel of the vehicle.

116 Front wheel drive vehicles require tie down straps on front end.

Note: Ensure the straps are securely attached to a sturdy section of the vehicle frame.

117 Lower the cradle by pressing the Remote "CRADLE UP/DOWN".

118 Cover the exposed portion of the rolls by pressing the Remote "COVER ON/OFF" button.

119 Ensure that the "BRAKE" is "OFF" and the "CRADLE" is "DOWN," and observe that the rolls are not moving.

Access the "Database Menu" screen by pressing <Enter>

Select “Vehicle Classes”, Press<Enter>

Select the appropriate vehicle ID by pressing <PgUp> or <PgDn>. The vehicle ID will be shown next to "Class" on the screen.

Recall or enter the vehicle ID, inertia (ETW), and A, B, and C coefficients. The inertia (ETW) and A, B, and C coefficients are listed on NVFEL Form 700-03 “Preconditioning & Sample Collection”.

Press <Escape> three times to return to database base menu

Select “Road Simulation” and press <Enter>

Press the <F1> key, enter the Test # and press <Enter>

Press <Enter>, enter your Operator Identification and press <Enter>

Look at the dynamometer computer screen and ensure that the "Augmented Braking" is "ON," unless indicated otherwise on NVFEL Form 700-03 “Preconditioning & Sample Collection” (Shown in Attachment “A”). Use the right or left arrow key to turn "Augmented Braking" either "ON" or "OFF." Then push <Enter>

Use the right or left arrow key to select "OFF" for "Grade" simulation.

Press <Esc> to Return to the "RUN MODE" of the "ROAD SIMULATION" screen,.

Verify that no warning message is displayed

If warning messages are displayed, address the warning (see "Horiba Dynamometer Operations Manual"), then press <F1>, re-enter the test number and your operator identification, followed by <Esc> to return to the "RUN MODE".

200 Vehicle Set-up:

201 If an exhaust sample analysis is required, use the appropriate connectors and flexible hose to connect the vehicle exhaust system to the Horiba Analysis System CVS.

If not, the vehicle exhaust may be routed to an “exhaust dump”.

Note: Ensure a silicone gasket is installed in the Marmon flange joints.

202 Open the hood or engine compartment cover.

203 Position the cooling fan(s) within 12 inches of the vehicle unless otherwise specified on Form 700-03 “Preconditioning & Sample Collection” shown in Attachment “A” and turn the power to the cooling fan(s) on.

Note: In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain vehicle cooling.

204 Using a calibrated tire pressure gauge, check and if necessary, adjust the drive tire pressure to the pressure specified on Form 700-03 “Preconditioning & Sample Collection.

205 Record the following information in the Vehicle Preconditioning section of Form 700-03 “Preconditioning & Sample Collection”.

The hood/engine compartment cover is open and the fan is operational.

The fan placement(s) in the vehicle drawing area provided.

The actual drive tire pressure as verified or set.

206 Proceed with the required vehicle operation when all installation and setup processes are completed.

300 Vehicle Removal:

The following steps are performed after completion of the required tests and verification of the reported data.

301 If not already done, press <F1> on the dynamometer computer keyboard. The message "END THIS TEST NOW? Y/N" will appear on the screen. Selecting "Y" will save the data and return the controller to the "SETUP MODE."

302 Press <ALT> and <P> to print out summary.

303 Retract the roll covers by pressing the "COVER ON/OFF" button on the Remote Microterminal.

304 Raise the cradle by pressing the "CRADLE UP/DOWN" button on the Remote Microterminal.

305 Disconnect all of the restraining devices from the vehicle. Loosen any tie down straps and remove from the vehicle. Disengage and remove the wheel chock assemblies from the non-drive tires. Slide the assemblies away from the tires and, if necessary, lift the assembly out of the tee-slot tracks to provide more clearance. When the cradle is lowered, the vehicle could move slightly along the roll. Since the movement can be up to one foot in either direction, personnel in the test cell should avoid close proximity to the vehicle when the cradle is lowered.

306 Lower the cradle by pressing the "CRADLE UP/DOWN on the Remote Microterminal.

307 Apply the roll brake by pressing the "BRAKE ON/OFF" button on the Remote Microterminal.

308 Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way.

309 Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected in accordance with NVFEL 709 “Hot Soak Evaporative Emission Test Procedure.

Note: If this is an FTP Test the vehicle engine must be turned off within five minutes of test completion.

310 After the vehicle is removed from the dyno, close the roll covers by pressing the "COVER ON/OFF" button on the Remote Microterminal.

9. Data Input:

9.1 Enter data as instructed in the Section 8 “Procedure” of this document.

10. Data Analysis:

10.1 Not Applicable

11. Data Record and Output:

11.1 The technician records the applicable requested data on NVFEL Form 700-03 "Preconditioning & Sample Collection" (Shown in Attachment "A") and signs and dates the form upon completion.

NVFEL Form 700-03 "Preconditioning & Sample Collection" remains with the vehicle in the test data packet until the relevant tests are completed.

12. Acceptance Criteria:

12.1 The vehicle must be installed approximately perpendicular to the dynamometer rolls.

12.2 The vehicle restraining hardware must be in good physical condition.

12.3 The exhaust connection hardware shall be in good physical condition and free of any obvious leak points.

12.4 All Marmom flange type connections must be assembled with a silicone gasket on one flange face. The gasket must be free of visible wear.

12.5 The tire pressure must be set at the tire pressure specified on NVFEL Form 700-03 "Preconditioning & Sample Collection" (Shown in Attachment "A").

12.6 The fan placement shall be as specified on NVFEL Form 700-03 "Preconditioning & Sample Collection" (Shown in Attachment "A").

13. Quality Provisions:

13.1 The technician is responsible for:

13.1.1 Performing the installation, set up and removal of test vehicles in accordance with this instruction.

13.1.2 Documenting the performance of the applicable steps on NVFEL Form 700-03 "Preconditioning & Sample Collection".

13.1.3 Verifying that data requested is accurate and complete on NVFEL Form 700-03 "Preconditioning & Sample Collection" and the form is signed and dated.

Attachment A

Preconditioning and Sample Collection
NVFEL Form 700-03

Preconditioning and Sample Collection

Vehicle ID # _____ Test Number _____

Fuel Type: _____ Volume: Main Tank:

Equivalent Test Weight: _____ pounds Actual Dyno HP: _____ Hp

Manf. Set Coefficient A: _____ Manf. Target Coefficient A: _____

Manf. Set Coefficient B: _____ Manf. Target Coefficient B: _____

Manf. Set Coefficient C: _____ Manf. Target Coefficient C: _____

Target Coastdown time: _____ Shift Schedule _____

Fan Placement: _____

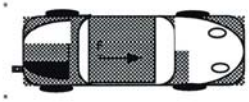
Additional Fan Placement: _____

Drive Code: Front Wheel Drive Set Tire Pressure to: 45 psi

Vehicle Preconditioning

_____ The tire pressure set @ _____ psi.

_____ Hood is open, fan(s) is (are) positioned within 12 inches and operational. Indicate the placement of the fan(s) below:



Record odometer on Form 700-01, Test Parameters

Paired Data

Sample Collection

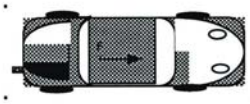
Twin Roll Dyno - Record last dyno usage time: _____

_____ Electric Dyno has been warmed and calibrated today

_____ The tire pressure set @ _____ psi.

_____ Noresco controller is in the "TEST" mode. Temp and dewpoint within tolerance..

_____ Hood is open, fan(s) is (are) positioned within 12 inches and operational. Indicate the placement of the fan(s) below:



I have performed all steps in accordance with the requirements of Test Procedure 700.

Technician's ID _____ Date _____

Form 700- 03: 02-09-2004